

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a silicon on insulator (SOI) substrate having an
5 insulating layer and a monocrystalline silicon layer formed
on a base substrate;

a source diffusion portion and a drain diffusion
portion both formed of a first conductive type and formed
from said monocrystalline silicon layer on the surface layer
10 of the SOI substrate;

a channel portion also formed from the
monocrystalline layer and also of said first conductive type
having one end adjacent to the source diffusion portion of
said first conductive type and the other end adjacent to the
15 drain diffusion portion of said first conductive type; and

a gate insulating film formed on the channel portion.

2. A semiconductor device comprising:

a SOI substrate having a surface monocrystalline
20 silicon layer and an insulating layer formed on a base
substrate;

a source diffusion portion and a drain diffusion
portion both having a first conductive type formed in the
surface monocrystalline silicon layer of the SOI substrate;

a channel portion also formed of said first conductive type and having one end adjacent to the source diffusion portion and the other end adjacent to the drain diffusion portion and

5 a gate insulating film formed on the channel portion, wherein the gate insulating film is a laminated film comprising an insulating film formed on the channel portion and a metal oxide film having a higher dielectric constant than the insulating film.

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3. The semiconductor device according to claim 1, wherein the channel portion is fully depleted.

4. The semiconductor device according to claim 1,
15 wherein no junction between the first conductive type and a second conductive type opposite to the first conductive type is formed in the monocrystalline silicon layer.

5. The semiconductor device according to claim 1,
20 wherein the SOI substrate is a laminated substrate consisting of a first monocrystalline semiconductor layer formed on the base substrate through an insulating film and a second monocrystalline semiconductor layer formed on the first monocrystalline semiconductor layer, wherein a first
25 lattice constant of the first monocrystalline semiconductor

and a second lattice constant of the second monocrystalline semiconductor differ from each other to form a strained silicon portion in the channel portion.

5 6. The semiconductor device according to claim 1,
wherein the concentration of a channel impurity forming the
channel portion is lower than the concentration of a
source/drain impurity forming the source or drain portions.

10 7. The semiconductor device according to claim 1,
wherein the thickness of the monocrystalline silicon layer
is 4 nm or less.

8. The semiconductor device according to claim 1,
15 wherein the gate insulating film contains a silicon oxy
nitride film or silicon nitride film.

9. The semiconductor device according to claim 1,
wherein the gate insulating film contains a metal oxide or
20 metal oxy nitride.

10. The semiconductor device according to claim 1,
wherein the gate insulating film contains an oxide of a metal
material selected from the group consisting of aluminum,
25 hafnium and zirconium, an insulating film containing at

least one of the oxides of these metal materials, an oxy nitride film of any one of the metal materials, a silicate film, or a laminated film thereof.

5 11. A semiconductor device comprising:

a SOI substrate having an insulating layer and a surface monocrystalline silicon layer formed on a base substrate;

10 at least one separation area made from an insulating material formed in the SOI substrate;

a first area in which a source diffusion portion and a drain diffusion portion both having a first conductive type are formed in the surface monocrystalline silicon layer of the SOI substrate bounded by the separation area;

15 a second area which is adjacent to the first area and adjacent to the separation area and in which opposite type source and drain diffusion portions having an opposite conductive type to the first conductive type are formed, wherein

20 a gate insulating film formed on a channel portion having one end adjacent to the source diffusion portion and the other end adjacent to the drain diffusion portion in the first and second areas,

the gate insulating film comprising a laminated film
25 of an insulating film formed on the channel portion and a

metal oxide film having a higher dielectric constant than the insulating film, and

wherein the channel portion of the first area has the first conductive type and the channel portion of the second
5 area has the second conductive type.

12. The semiconductor device according to claim 2, wherein the channel portion is fully depleted.

10 13. The semiconductor device according to claim 2, wherein no junction between the first conductive type and a second conductive type opposite to the first conductive type is formed in the monocrystalline silicon layer.

15 14. The semiconductor device according to claim 2, wherein the SOI substrate is a laminated substrate consisting of a first monocrystalline semiconductor layer formed on the substrate through an insulating film and a second monocrystalline semiconductor layer formed on the first
20 monocrystalline semiconductor layer, wherein a first lattice constant of the first monocrystalline semiconductor and a second lattice constant of the second monocrystalline semiconductor differ from each other to form a strained silicon layer in the channel portion.

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15. The semiconductor device according to claim 2, wherein the concentration of an impurity forming the channel portion is lower than the concentration of an impurity forming the source or drain portions.

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16. The semiconductor device according to claim 2, wherein the thickness of the monocrystalline silicon layer is 4 nm or less.

10 17. The semiconductor device according to claim 2, wherein the gate insulating film contains a silicon oxy nitride film or silicon nitride film.

18. The semiconductor device according to claim 2, wherein
15 the gate insulating film contains a metal oxide or metal oxy nitride.

19. The semiconductor device according to claim 2, wherein the gate insulating film contains an oxide of a metal
20 material selected from the group consisting of aluminum, hafnium and zirconium, an insulating film containing at least one of the oxides of said metal materials, an oxy nitride film of any one of said metal materials, a silicate film, or a laminated film thereof.